

# DEEP-SEA MONSTER



A sea monster attacks a ship in a wood engraving from the 19th century.

Deep down in the darkest depths of the oceans lives a creature that feasts on shark for dinner. It is one of the biggest sea creatures. It lives so deep down that people have only seen its natural **habitat** a few times. What could it be? It's the giant squid! People used to think that the giant squid was an imaginary creature—the subject of tall tales. But this **fascinating** creature is very real indeed.

## The Giant Squid's "Family"

Giant squids belong to the group of animals called **mollusks**. These animals have soft bodies and no backbones. Most mollusks have shells. These shells may be inside or outside of the body. Clams, snails, and oysters have shells outside the body. Squids have shells inside their bodies.

## Vo • cab • u • lar • y \

**habitat** (hab•i•tat)—the place where something normally lives

**fascinating** (fas•uh•nay•ting)—very interesting

**mollusks** (mol•uhks)—any of a large group of animals that have soft bodies, are without backbones, and usually live in saltwater

## Strategy

### Make Connections

by relating information that I already know about the subject to what I'm reading.



Write notes on your own paper to tell how you used this strategy.

Slugs and octopuses have no shells at all. Although most mollusks live in or next to water, some do not. Snails and slugs live on land.

Giant squids are also **cephalopods**. Cephalopods are mollusks that have large heads, big eyes, and **tentacles**. Tentacles are long, slim parts growing around the mouth or head of some animals. They are used for feeling and gripping. Cuttlefish and octopuses are cephalopods, too. Most cephalopods have a sac that squirts a dark inklike fluid. When a squid squirts its ink into the water, its enemy has a hard time seeing the squid. That makes it easy for the squid to escape.

### The Squid's Body

A giant squid can be more than 60 feet long and weigh more than 800 pounds. Look at the diagram of the giant squid. Are you surprised to see both arms *and* tentacles? The squid has 8 arms and 2 tentacles. Compared with the tentacles, the arms are thick and short. Each arm has 2 rows of cup-shaped suckers, parts used for holding things with suction. The tentacles have suckers, too, but just at the ends, on the palms.

When the giant squid hunts, it reaches out with its tentacles to grab its prey. The suckers on the palms have hooks that help the squid hold on. Then the squid draws its prey toward its mouth. The arms grab the prey and bring it to the jaws.

The giant squid has a big head, about 3 feet long. Its mouth is nestled inside the tentacles and arms. The top jaw is pointed. The 2 jaws work together, like a beak, to cut food into pieces. Inside the mouth the radula breaks the food into smaller pieces. Then it pushes the food down into the throat, or **esophagus**. The radula is like a tongue with teeth.



The giant squid has incredibly large eyes. Its eyes can be as big as 10 inches across—larger than the headlights on a car! Because its eyes are so well developed, the giant squid can see very well.

## Vo • cab • u • lar • y

### cephalopods

(sef•uh•luh•podz)—mollusks with large heads, large eyes, tentacles, and an ink sac

**tentacles** (ten•tuh•kuhlz)—narrow, flexible parts that certain animals use for feeling, grasping, and moving

**esophagus** (i•sof•uh•guhs)—the tube that connects the throat with the stomach

## The Squid's Shell

The giant squid's shell gives the squid its shape and supports its muscles. Its shell is called a pen. The pen is inside the squid's outer covering of muscle called the mantle. The mantle is a pale color on the bottom and becomes brownish or dark red at the top. The squid can change the color of its mantle, depending on how dark the water is or what the squid is doing.

## How Giant Squids Breathe

Like a fish, the giant squid breathes through gills. The gills are in its mantle. As the squid moves, water is forced through the two gills so the squid can breathe. ● .....

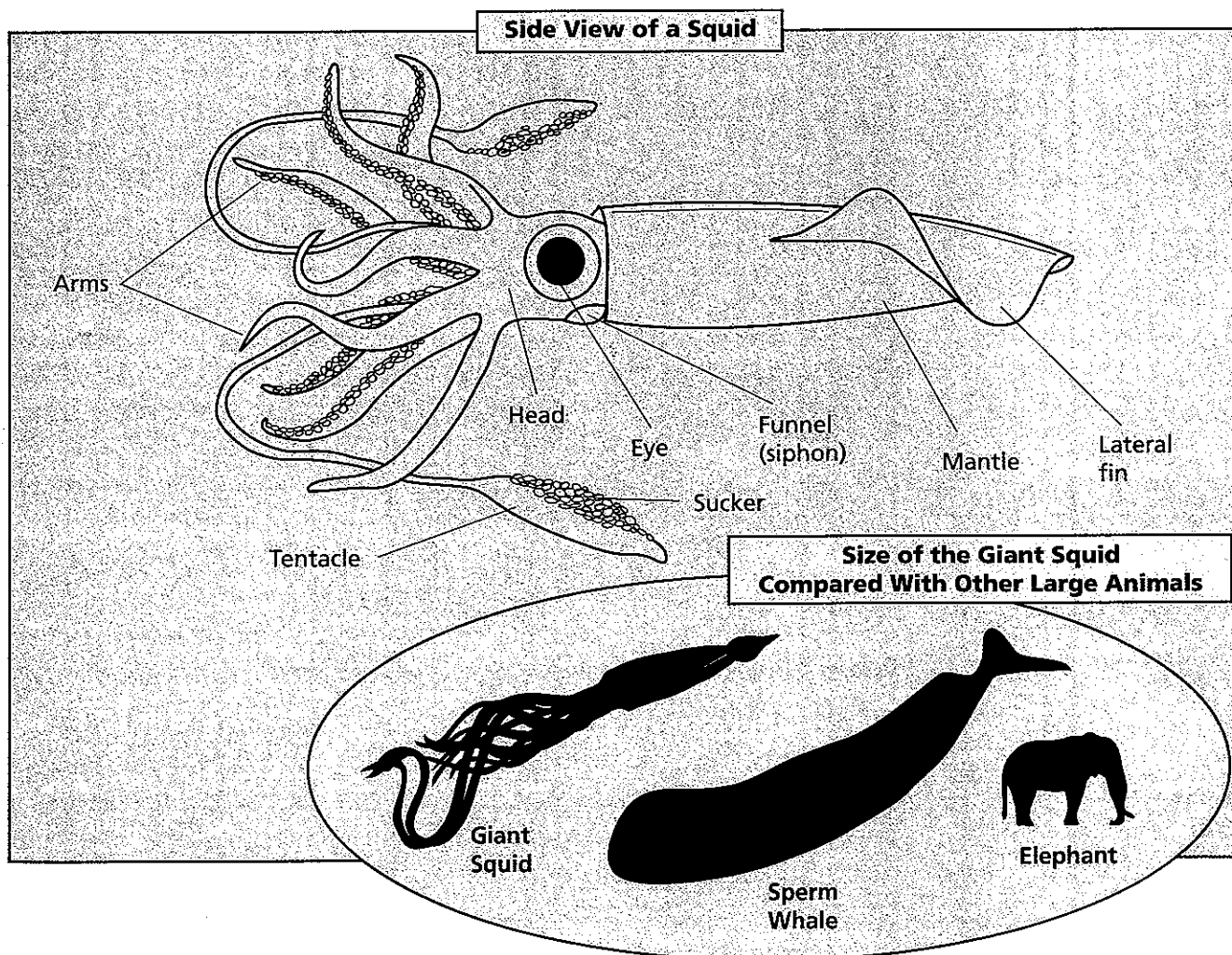


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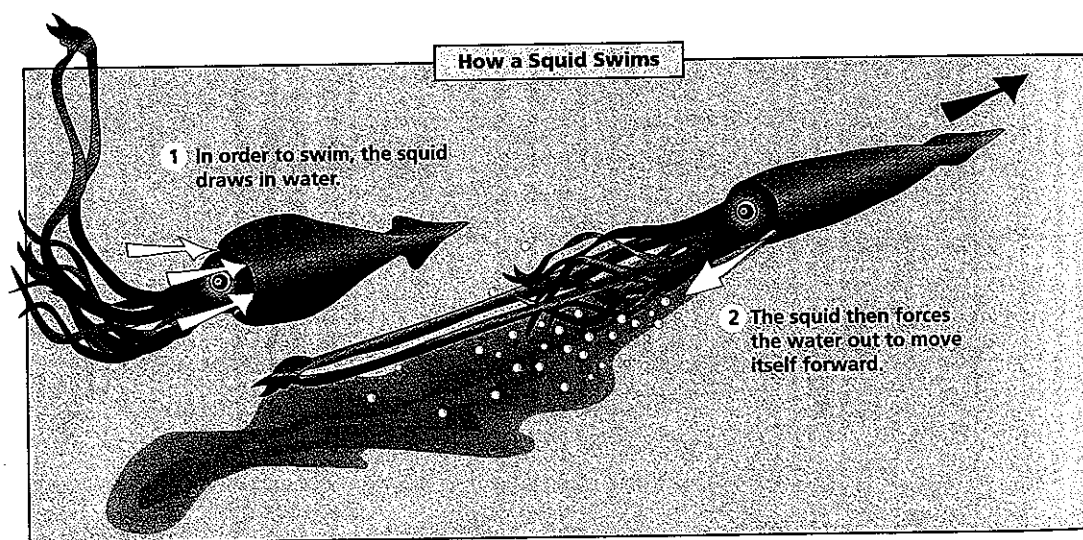
Write notes on your own paper to tell how you used this strategy.



## A Jet-Propulsion Sea Creature

The squid is jet-propelled. How does it work? To swim forward, the giant squid draws water in through openings between the head and the mantle, then forces the water out through the **siphon**, an organ that **expels** water. This shoots the squid forward. To change direction, the squid moves its fins. The fins also help keep the squid **stable**. Squids swim quickly and gracefully, so they easily catch their prey.

The giant squid can move up and down. It does this by changing its **buoyancy**. Buoyancy is the ability to float. Because the giant squid is heavy, it needs to change its buoyancy to avoid sinking. How does it do that? For a squid, it's easy. Its muscles contain **ammonium** ions. These tiny particles make the squid light. When the squid's muscles have a lot of these ions, the squid can rise in the water. As the squid releases some of the ions, it becomes heavier, allowing it to sink.



## How the Giant Squid Reproduces

Scientists aren't exactly sure how the giant squid reproduces. They think that when giant squids mate, they wrap their tentacles around each other. Two of the male's arms carry sperm to the female. Both the sperm and the eggs of giant squids are wrapped in a jellylike substance. This protects the eggs and provides food for them. The female then lays many tiny white eggs that float in the water.

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## Vo•cab•u•lar•y

**siphon** (sy•fuhn)—a tube filled with liquid that is forced by air pressure to flow up and out

**expels** (ik•spelz)—forces or drives out

**stable** (stay•buhl)—steady

**buoyancy** (boy•uhn•see)—the ability to remain afloat

**ammonium**

(uh•moh•nee•uhm)—a chemical ion

When the young squids come out of the eggs, they are well developed. They look like small adult squids. At first, the young squid stays attached to the egg. The food in the egg continues to **nourish** the young squid until it is old enough to find its own food.

## Living in the Abyssal Region

Giant squids live deep in the waters of the Atlantic and Pacific oceans. In their home territory, the water is probably between 1,640 and 4,900 feet deep. This part of the ocean that is home to the giant squids is called the **abyssal** region. Most of the region is a flat ocean plain, but there are some volcanic mountain peaks. Some peaks are tall enough to break the surface of the water. The abyssal region has very cold water, no light, and strong water pressure. About 85 percent of all the oceans in the world are made up of this deep-sea **environment**. It is the largest environment in the world.

Similar to a desert on land, this region has few forms of plant and animal life. Few living forms can survive here. Because there aren't many creatures, some of the creatures here grow to be quite large. All of the animals that live here are **predators**. Like the giant squid, these fish—such as dragonfish, knifefish, hatchet fish, and sea devils—hunt live prey. They also eat the bodies of other animals that have drifted to the bottom of the ocean.

The giant squid almost never comes to the surface of the ocean on its own. In February 2003, researchers finally got a glimpse of living giant squid babies. But humans have rarely seen a giant squid in its habitat. Mostly, we have learned about the giant squid by studying dead ones caught in fishing nets or washed up onshore.



Squid feeding on prey

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## Vo•cab•u•lar•y

**nourish** (nur•ish)—to feed

**abyssal** (uh•bis•uhl)—great depths of the ocean

### environment

(en•vy•ruhn•muhnt)—surroundings

**predators** (pred•uh•tuhrz)—

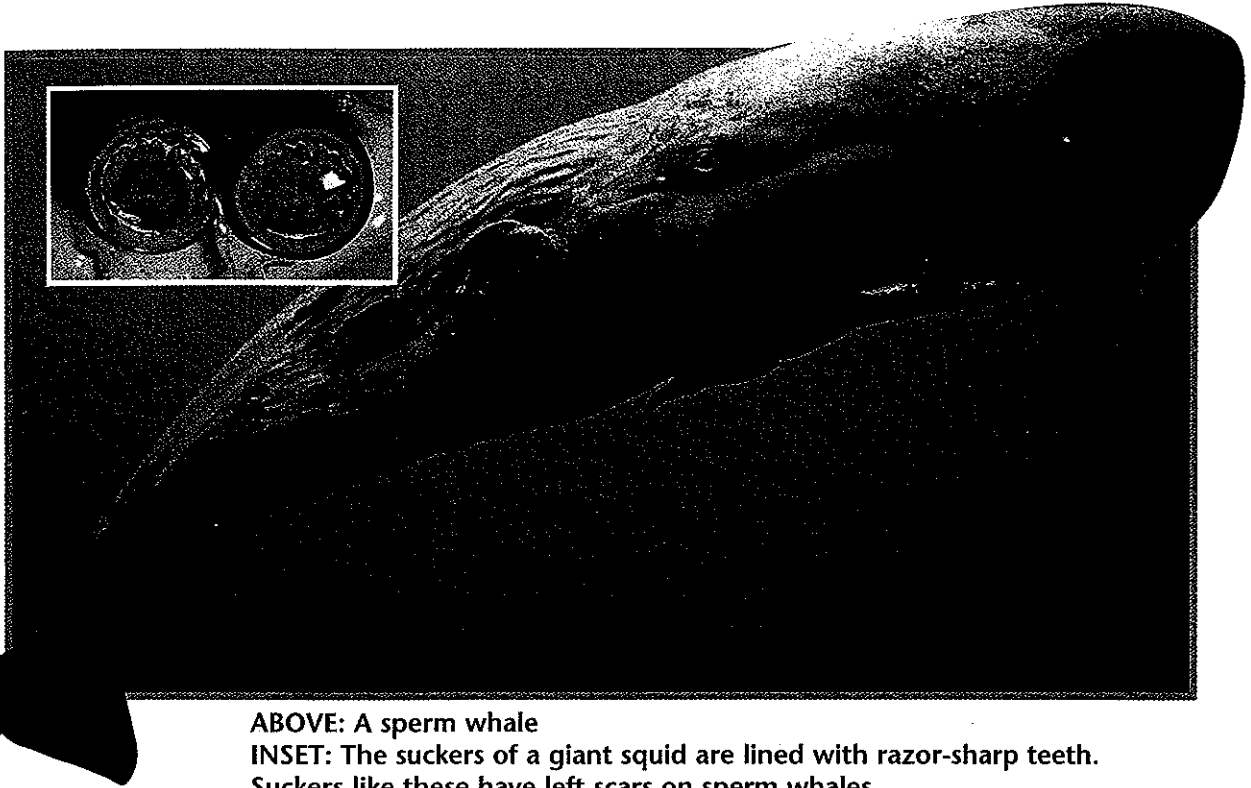
animals that live by hunting and eating other animals



## The Giant Squid's Mortal Enemy

Does the giant squid have an enemy? Could a creature this huge actually have an enemy? Yes. The giant squid and the sperm whale are fierce enemies.

Whales live at the ocean's surface. They are **mammals** and need to breathe air. Whales are excellent divers, and they dive to capture food. The sperm whale, in fact, is able to dive at least a mile (5,280 feet) down. This takes it into the giant squid's home waters.



ABOVE: A sperm whale

INSET: The suckers of a giant squid are lined with razor-sharp teeth. Suckers like these have left scars on sperm whales.

Sperm whales have huge mouths and powerful jaws. Giant squids have long tentacles and strong arms with powerful suckers. When these foes meet, the squid wraps its tentacles around the whale and holds it tight with its arms. If the whale cannot grab onto the squid with its jaws to kill it, the squid holds the whale underwater until the whale drowns.

Scientists have learned how large giant squids can grow by studying the scars around the mouths of sperm whales. A 50-foot squid has suckers that leave a 4-inch scar. Scientists have found sucker scars that are 18 inches across. They think that the giant squid that left these scars may have been more than 200 feet long!

### Vo•cab•u•lar•y

**mammals** (mam•uhlz)—  
animals whose females produce  
milk to feed their young

## Why Giant Squids Are Important

Giant squids are important. They are a **vital** link in the ocean food chain. The food chain is a connection among plants and animals in which each living thing feeds upon the one below it and is eaten by the one above it. At the bottom of the chain are **microplankton**. These tiny, plant-like organisms float, often at the surface of the ocean. Like plants, microplankton use the sun's energy and nutrients from the water to grow. Microplankton are food for animal **microorganisms**. These are animals so small that you can see them only with a microscope. Fish eat animal microorganisms. Giant squids eat fish. Next in line in the chain is the sperm whale, whose prime food is squid.

Does anything eat the sperm whale? Until 2003, scientists did not believe so. However, in that year, the largest squid to date was discovered. Called the colossal squid, it is even larger than the giant squid. Its prey—sperm whales.

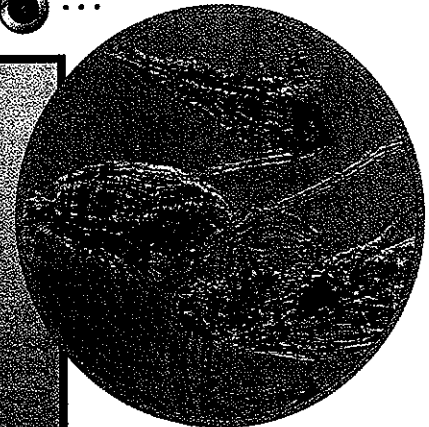
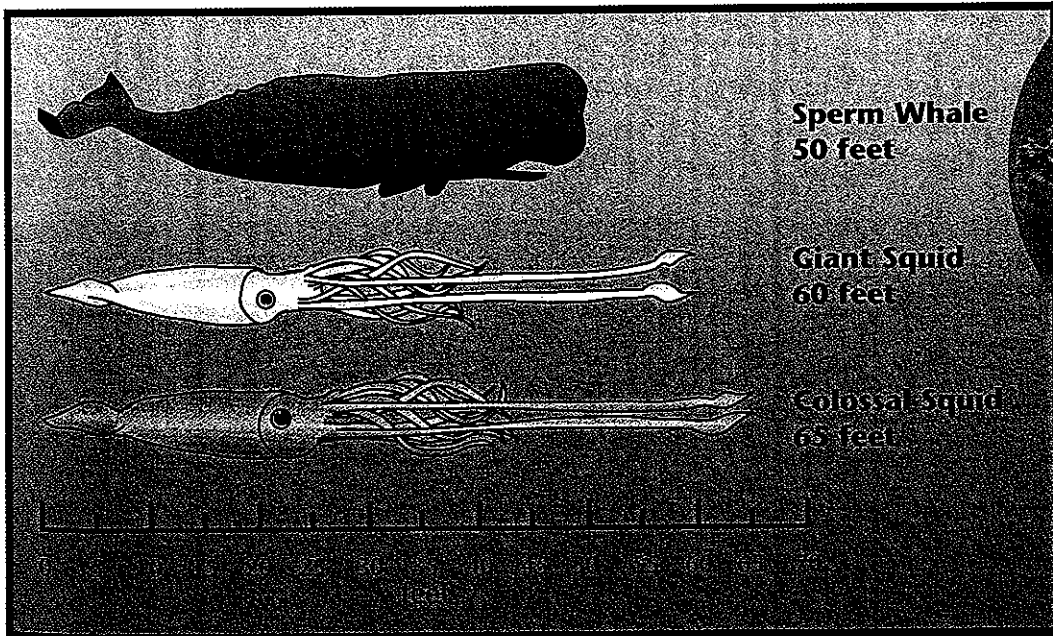


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Write notes on your own paper to tell how you used this strategy.



Marine microplankton greatly magnified

## What Scientists Have Learned by Studying the Giant Squids

Scientists have learned much about the giant squid. The giant squid, for instance, has keen eyesight and sees well in very dark water. This is because its eyes have a lot of cells that “catch” light. In fact, some cephalopods have twice the number of light-catching cells that humans have. In the same amount of light, it is believed that squids

## Vo • cab • u • lar • y

**vital** (vyt•l)—necessary to life

### microplankton

(my•kroh•plangk•tuhn)—tiny plantlike organisms on the surface of the ocean

### microorganisms

(my•kroh•or•guh•niz•uhmz)—living things so small they can only be seen by using a microscope

## Strategy

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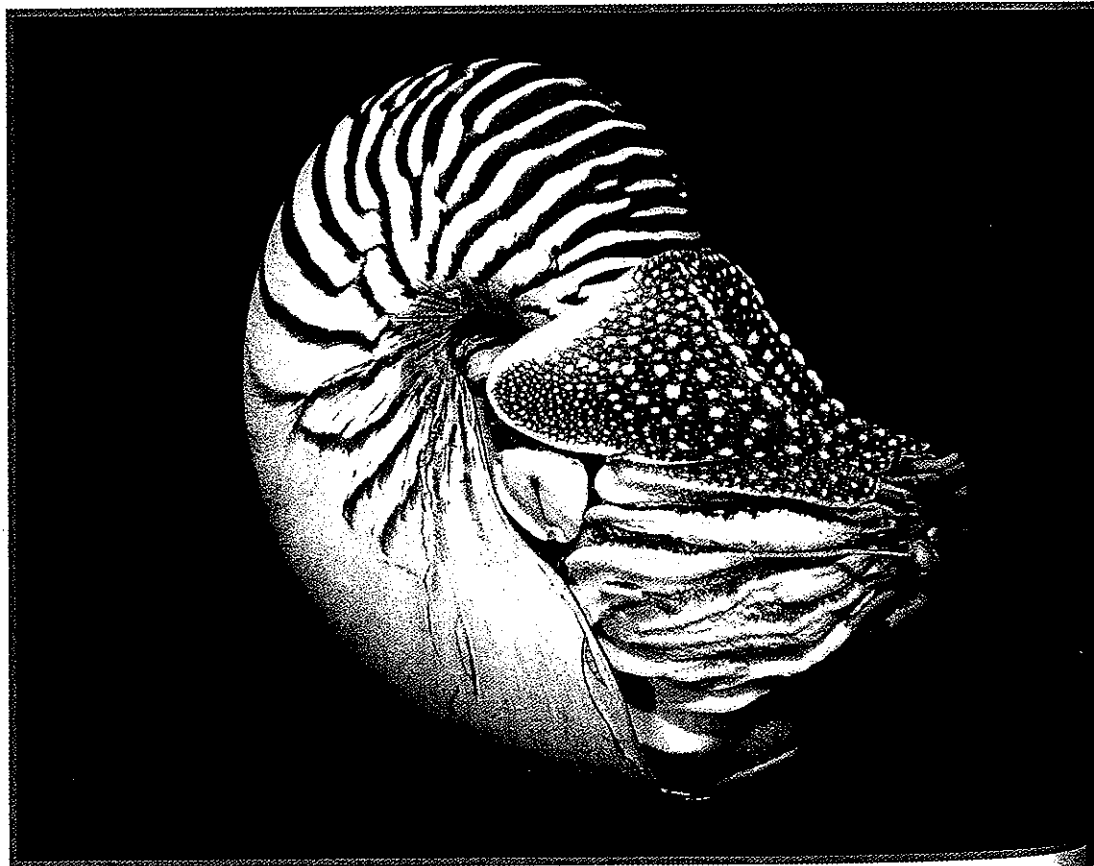
could see better than humans. They may be able to see details of objects that people could not see at all. All squids also have well-developed brains and complex nervous systems. These help them move and behave in complicated ways. The huge size of the giant squid makes it especially interesting to scientists.

### How the Giant Squid Evolved

We don't know how or why this ocean giant developed as it did. Scientists do know that the squid and the octopus have been around for at least 200 million years. Many cephalopods existed long before that; some no longer exist. The earliest cephalopods, such as the nautilus, had external shells. Some had shells that were 3 feet across. Today, the nautilus is the only one from this group of cephalopods that has survived.

Some scientists think that deep-sea animals, like the giant squid, once lived near the surface. As ocean temperatures rose, they may not have been able to adapt to the warmer water. Or the animals may have changed so much that they couldn't live near the surface. In either case,

This nautilus is a cephalopod.





they moved deeper in order to survive. However, since the discovery of the colossal squid, we now know that some squid can move up to the surface and live. Many more facts about giant and colossal squids are yet to be found.

## Answers in the Ocean

Giant squids, colossal squids, sperm whales, and other giant creatures have survived for a long time. Long before the earliest recorded sightings of giant and colossal squids, people told stories of deep-sea monsters. Tales were told of long arms wrapping around the masts of sailing ships or dragging sailors into the sea. Many of the descriptions sound like a huge squid or octopus. Do you think that these stories were about giant or colossal squids, or do you think there might be other bigger deep-sea monsters waiting to be discovered? The depths of the ocean hide the answer—for now. Maybe you will someday be part of a scientific team investigating the latest deep-sea discovery!

Think About  
the

**Strategy**

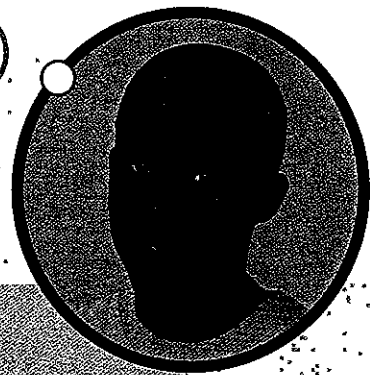
AFTER READING

### Recall

by summarizing the selection in writing or out loud.



Write notes on your own paper to tell how you used this strategy.



# The Remarkable Leech



In 1799, an army led by the French general Napoleon Bonaparte was marching from Egypt to Syria. Along the way, many soldiers began to die in strange ways. Some men **suffocated**. Some men mysteriously bled to death—but they had no wounds. Why were they dying?

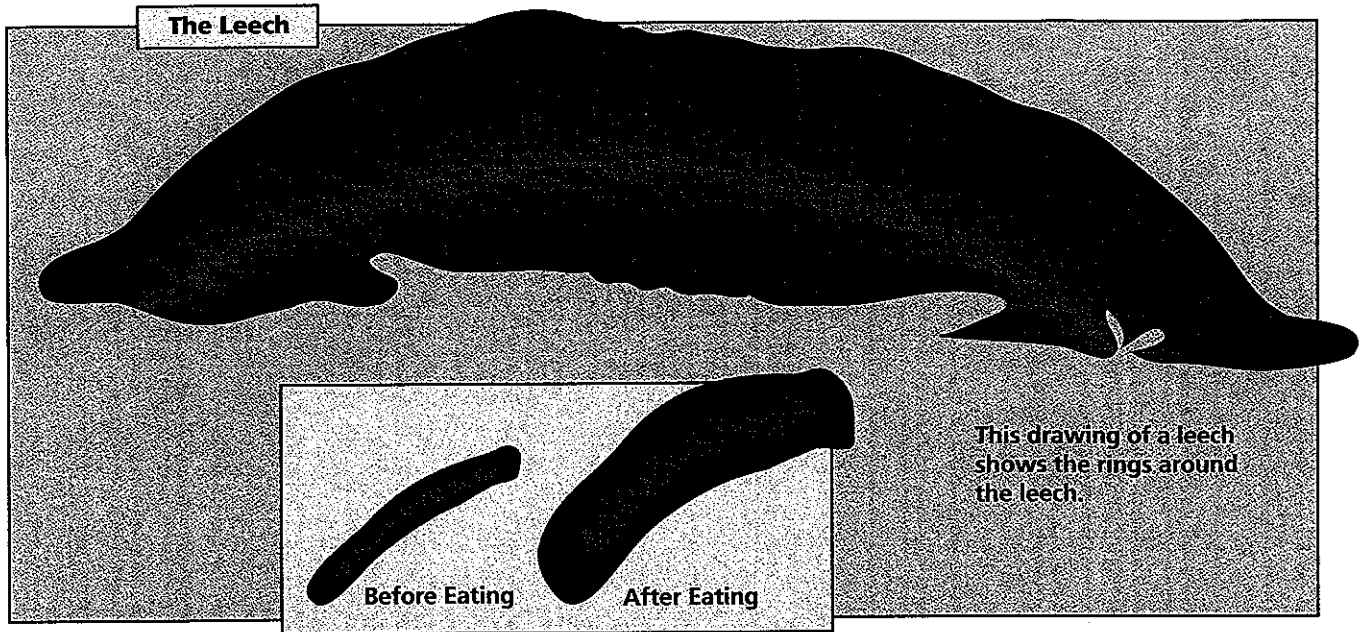
## The Answer

The desert heat was strong. The thirsty men drank from every water source they could find. They did not know that tiny leeches lived in many of the water holes. When the men drank, they swallowed leeches along with the water. The leeches attached themselves to the inside of the soldiers' mouths and throats. Some entered the men's lungs.

**Vo • cab • u • lar • y \**

**suffocated** (suf • uh • kay • tid)  
—died from lack of oxygen

Then, the leeches began drinking their blood! As the leeches drank the men's blood, the leeches' bodies swelled. The tiny leeches grew larger and larger. They blocked the soldiers' air passages, and the men couldn't breathe. Soldiers who had swallowed too many leeches died from loss of blood.



### What Is a Leech?

If you have ever waded in a stream and come out with leeches stuck to your toes and ankles, you know what a leech looks like. But just what is a leech?

A leech is a kind of worm. Its body is divided into 34 circular sections, or rings. At one end of the leech is a small sucker—like a suction cup—that contains the leech's mouth. In some types of leech, the mouth has 3 teeth. The leech uses these teeth to break through the skin of its prey. At the other end of the leech is a second, larger sucker. The leech uses this sucker to hold on to surfaces.

There are about 300 different **species**, or types, of leech. Most leeches are **parasites**. They stick to other animals and live by feeding on their blood. Some species of leech eat **decayed** plant matter. Others eat smaller animals, such as snails and worms.

### Vo•cab•u•lar•y

**species** (spee•sheez)—  
a group of animals or plants  
that are similar and are able to  
mate and have offspring

**parasites** (par•uh•sytz)—  
organisms that live and feed  
on other organisms

**decayed** (di•kayd)—rotten

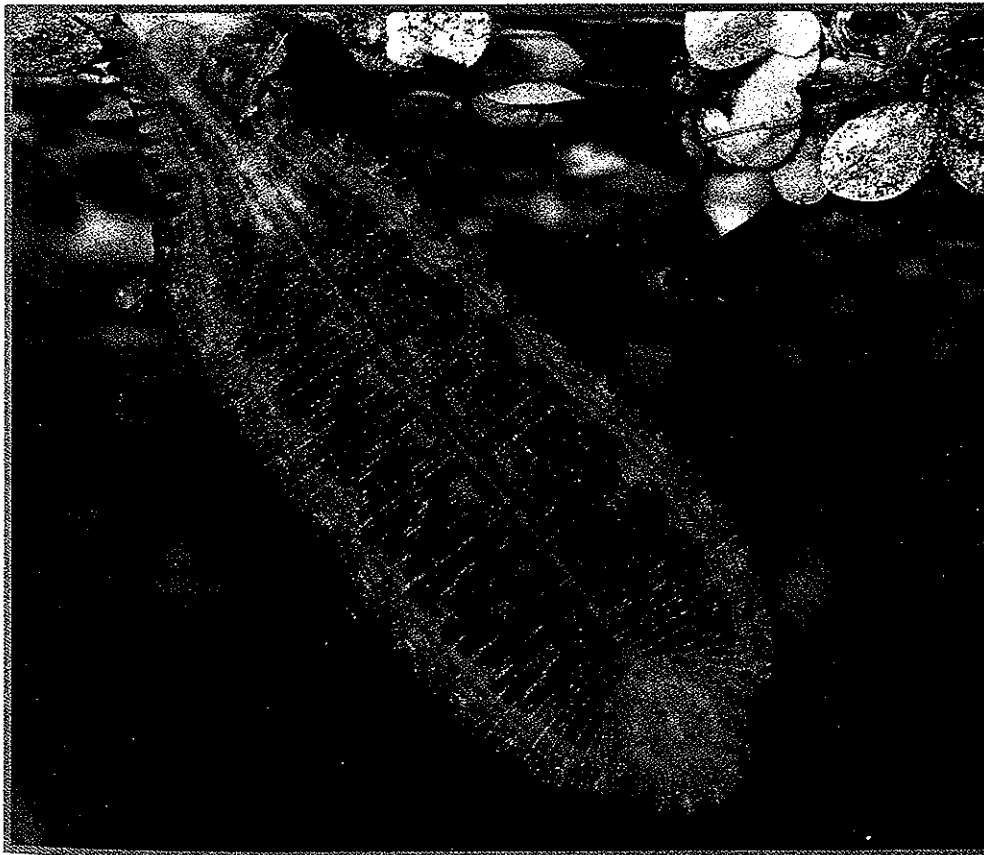
Leeches range in size from 1/4 inch to 18 inches long. Most leeches are 1 to 2 inches long. As a leech moves, it stretches its body into a thin, snakelike shape. By stretching, the leech seems to be much longer than it really is. A leech can eat 10 times its weight in blood. As a leech sucks its prey's blood, its body swells. A leech can double or triple its size in minutes.

Some leeches are a dull greenish brown. Others are black. Still others have lines of spots down their backs. Some are even bright with red, orange, or yellow stripes.

### **Where Leeches Live**

Many leeches are tropical animals that live in jungles and swamps. However, leeches are found all over the world in all types of climates. They live in desert water holes and on mountains. Strange as this may sound, there are more leeches living in Antarctic waters than in all the tropics.

Most leeches are **aquatic**. They live in freshwater ponds and streams. A few species are found in both saltwater and freshwater environments. Aquatic leeches can swim.



A pond leech

**Vo • cab • u • lar • y**

**aquatic** (uh • kwat • ik)—living  
in or on the water

Both aquatic and land leeches expand and **contract** their muscles in order to move. Some can use their suckers to move. They attach one sucker to an object, then flip over to attach the other sucker. The motion is similar to a giant metal spring going end over end down stairs.

Land leeches live in hot, damp parts of the world. They wait for their prey in wet plants and under decaying leaves. Soldiers in Vietnam reported that in the jungle, leeches dropped from the trees like rain. The soldiers had to cover all parts of their bodies. Still, leeches were able to get inside their clothing. Small leeches have been known to squeeze through the lace holes of hiking boots!

Are leeches anything but pests? You'd be surprised!

### Leeches in Early Medicine

Long ago, doctors thought that many diseases could be cured by bloodletting. This means draining people's blood. The Egyptians, Aztecs, and other ancient peoples practiced bloodletting. For a long time, doctors thought that bloodletting could cure many ills. They used it for mental illness, skin disease, and fever, among other things.

This 17th century illustration shows a young doctor bleeding a wealthy woman as her servants stand by.



### Vo • cab • u • lar • y

**contract** (kuhn•trakt)—  
to make smaller by drawing  
together



In the 18th and 19th centuries, doctors used leeches to treat headaches. They stuck leeches to the sides of the forehead and let them draw blood! For many reasons, doctors liked to use leeches instead of cutting patients with knives. Leeches were easy to find—they lived in marshes, ponds, and streams all across Europe. They also stuck themselves to human skin without causing pain. The doctors could control how much blood a leech sucked. Best of all, patients didn't worry about cuts or lasting scars.

As we now know, losing blood doesn't cure disease. It just makes people weaker and sicker. By the late 1800s, science won out. Better methods and medicines were found. Bloodletting was no longer seen as a cure for everything.

## The Worm Returns

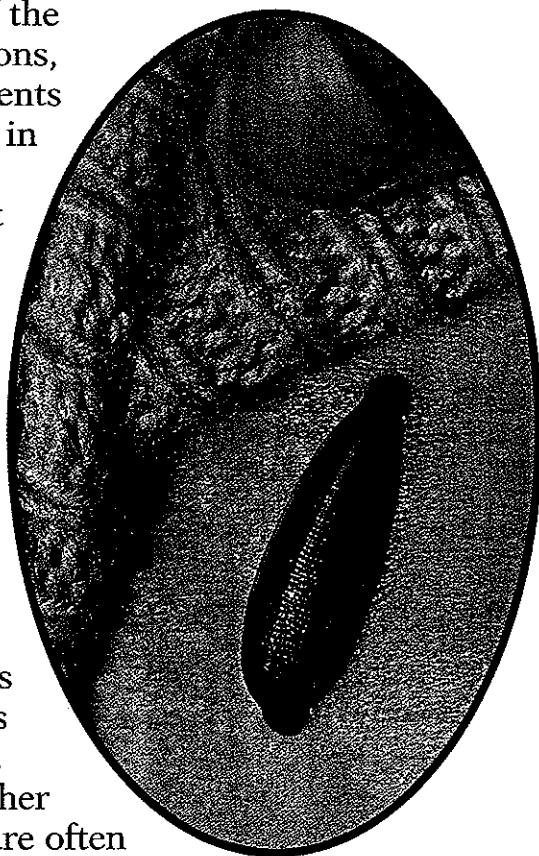
Leeches are now making a comeback! This does not mean a return to bloodletting. Instead, doctors have come to see just how remarkable leeches are.

Surgeons can now reattach fingers, ears, and other body parts that have been cut off. However, there are often problems with tiny veins the surgeons can't reconnect. Fresh blood flows into the reattached body part but has no way to leave it. Blood can collect in pools in that body part. This can cause swelling, pain, and the death of the body part. Doctors use leeches to drain off the extra blood. When the leech is full of blood, it just drops off.

The procedure is nearly pain-free. Leeches have an **anesthetic**—a painkiller—in their saliva. Leech saliva also contains an **anticoagulant**; it keeps blood from clotting. After the leech drops off, the wound it creates keeps bleeding for several hours. This helps keep the swelling down.

## Leeches to the Rescue

In 1985, a boy was brought to a hospital after being bitten by a dog. The dog had bitten off the boy's ear. Surgeons sewed the ear back on. However, clots began forming in the boy's veins. The doctors tried anticoagulants, but that did not solve the problem. Although blood



A leech after sucking blood for an hour

### Vo • cab • u • lar • y

**anesthetic** (an•is•thet•ik)—a drug that causes loss of feeling or consciousness in order to block pain

**anticoagulant** (an•tee•koh•ag•yuh•luhnt)—a substance that prevents clotting of blood

was flowing to the boy's ear, it could not get from his ear back to his heart. Doctors then stuck leeches onto the boy's ear every few hours. He called them his "tickle friends" and gave them names like Fred and Chubby. The leeches got the blood flowing. After a week, the boy went home with his ear safely attached.

A leech sucking blood from a finger



A factory worker in England caught his long hair in a machine. It tore off his scalp. After surgeons reattached the scalp, they applied leeches to help the blood flow. The treatment was a success.

In another case, a woman had caught her fingers in a power saw. One finger was cut off, and three others were badly hurt. Surgeons reattached the **severed** finger. However, it began to turn black as clots formed in the veins. At first, the surgeons were afraid they would have to remove the finger. Instead, they used leeches to drain off the blood. The woman's finger was saved.

How do patients feel about being treated with leeches? At first, most people are scared. Few people enjoy the idea of having a leech suck their blood! When they see that the treatment works, though, they change their minds.

Today, leeches are used in many medical procedures. The worm has returned!

## A Chemical Resource

Scientists have learned that leeches make several useful chemicals. Anticoagulants are just some of these. Some chemicals produced by leeches are used to treat blood disorders and severe bruises.

Another important chemical in leech saliva digests the "cement" that holds cells together. Separating the cells lets the leech saliva spread deeper than it normally would. This increases the flow of blood to the leech. Doctors use this chemical to speed the delivery of some drugs and anesthetics.

### Vo•cab•u•lar•y

**severed** (sev•uhrd)—to have become cut off or detached

Scientists are studying many other substances that leeches make. Leeches can safely store the blood they drink for months. An **antibiotic** the leech produces keeps the blood from spoiling. A strong antibiotic such as this can have many uses in people. Another substance in the leech makes blood vessels bigger. This may be useful in treating bad headaches.

### Helpful Tool in Fighting Cancer

Scientists studying lung cancer found that a substance in leech saliva can stop the cancer from spreading. This same substance can also reduce the side effects of some cancer drugs.

Some scientists think leeches will be used in the fight against heart attacks and strokes. Leeches may even be used to treat eye diseases that can lead to blindness.

What other wonders may come from research into leeches? Some researchers think that their studies of leech nerve cells will explain how damaged nerve cells regrow. They hope that their studies will show how nerves are formed and how they work.

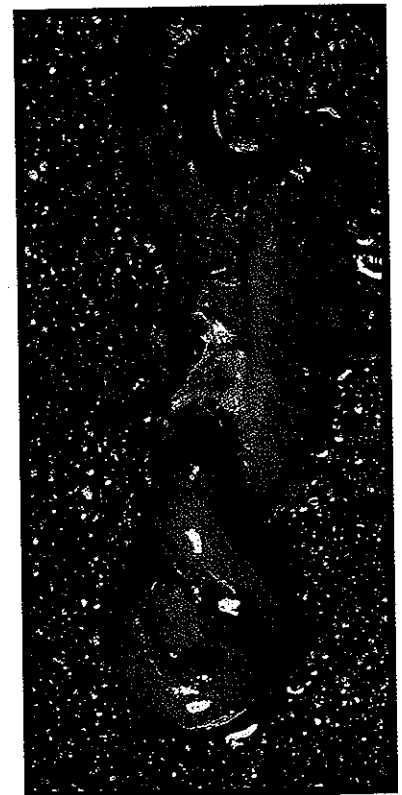
### New Life for Leeches

The need for leeches in the 1800s nearly led to their dying out. In 1863 alone, hospitals in London, England, used more than seven million leeches! The new interest in leeches may threaten this animal that is disappearing from the wild.

By the late 1980s, leeches were becoming hard to find in Europe. Scientists had collected too many. Another reason leeches were disappearing was that the wetlands where leeches lived were being drained. No one really knows whether the medicinal leech is in danger. However, collecting leeches in the wild no longer fills the need.

Breeding leeches has become one way to meet the demand and save the species. In 1983, Biopharm, a Welsh company, began raising leeches for medicine. Today, it sells live leeches and the chemicals they make to countries around the world. Meanwhile, in the wild, leeches are free to recover.

Leeches can be annoying creatures. But they can also be important medical tools. Because they are so useful, it looks as if people are "stuck on" leeches!



Scientists are now breeding leeches. These leeches are shown with their eggs.

### Vo • cab • u • lar • y

**antibiotic** (an•ti•by•oot•ik)  
a substance that can stop the growth of germs